The genus *Flaviporus* Murrill (Polyporaceae)

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Flaviporus is characterized by lignicolous, relatively small and very thin basidiomes, small and broad spores, small pores, dimitic hyphal system, generatives with clamps and agglutinated hyphae. The species occur mostly in the tropics and southern hemisphere but *F. brownei* extends into Europe where it is restricted to glasshouses and mines. Seven new combinations are proposed: ***F. hydrophilus*** (Berk. & Curt.) Ginns, ***F. liebmanni*** (Fr.) Ginns, ***F. minutisporus*** (Reid *et al.*) Ginns, ***F. semisupiniformis*** (Murr.) Ginns, ***F. subundatus*** (Murr.) Ginns, ***F. verniciflııus*** (Berk.) Ginns, and ***Rigidoporus cartilagineus*** (Berk. & Br.) Ginns. A new variety is described: ***F. liebmanni*** var. ***subglobisporus*** Ginns.

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Le genre *Flaviporus* est caractérisé par des basidiomes lignicoles, relativement petits et très minces, par des spores petites et larges, des pores petits, un système hyphal dimitique, des génératrices avec anses d'anastomose et des hyphes agglutinés. Les espèces se rencontrent surtout dans les régions tropicales et dans l'hémisphère sud, mais *F. brownei* se retrouve jusqu'en Europe où il est restreint aux serres et aux mines. Sept nouvelles combinaisons sont proposées: ***F. hydrophilus*** (Berk. & Curt.) Ginns, ***F. liebmanni*** (Fr.) Ginns, ***F. minutisporus*** (Reid *et al.*) Ginns, ***F. semisupiniformis*** (Murr.) Ginns, ***F. subundatus*** (Murr.) Ginns, ***F. verniciflııus*** (Berk.) Ginns et ***Rigidoporus cartilagineus*** (Berk. & Br.) Ginns. Une nouvelle variété est décrite: ***F. liebmanni*** var. ***subglobisporus*** Ginns.

[Traduit par le journal]

During the study of collections labelled with epithets which have been referred to the genus *Rigidoporus* Murr., several of the species were distinct from typical *Rigidoporus* species. These segregated species appeared to be congeneric and referable to *Flaviporus* Murr. Accordingly, I became interested in the relative circumscriptions of *Flaviporus* versus *Rigidoporus*.

The following report, based in part on the study of type specimens, presents a generic description, a key to the species, descriptions of seven species, proposes seven new combinations and a new variety, and discusses several species excluded from *Flaviporus*. In describing the wall thickness of the hyphae three terms are used (cf. Ginns 1976, p. 107). Hyphae with walls that are too fine for accurate measurement are described as "thin-walled;" those with the outer and inner limits of the wall that are distinct and separate are described as "rather thin-walled;" and those with the lumen which is less than one-third of the diameter of the hyphae are described as "thick-walled."

Flaviporus Murr., Bull. Torrey Bot. Club, 32: 360. 1905.

= *Baeostratoporus* Bond. & Singer in Singer, Mycologia, 36: 67. 1944.

Basidiomes lignicolous, small and thin, effused, reflexed, or dimidiate to flabelliform, sessile to laterally substipitate; context when fresh watery-fleshy, when dry hard, woody to horny, thin (to 1.5 mm thick); tubes small (6–20 per millimetre), to 2.5 mm long, thin-walled, waxy-hard, typically yellow to cream coloured or flesh pink.

Hyphal system dimitic; hyphae typically agglutinated; generatives hyaline, thin- to thick-walled, 2.5–8 μm in diameter, with clamp connections and simple septa; skeletals thick-walled, aseptate or with rare simple septa, in some species occasionally branched; tramal cystidia present in some species; basidia clavate, 6–15 μm × 3.6–5 μm; spores subglobose, broadly oblong to broadly ellipsoid, adaxially flattened to slightly concave, 2.4–3.6(–3.8) μm × 1.6–2.5 μm.

HOLOTYPE SPECIES: Basionym *Polyporus rufoflavus* Berk. & Curt., now a synonym of *F. brownei* (Pers.) Donk.

Flaviporus is a small genus. Murrill (1905*a*, p. 360) in proposing the genus included two species, *Polyporus rufoflavus* and *P. crocitinctus* Berk. & Curt. The other names which previously have been transferred to *Flaviporus* are, in chronological order, *P. canaliculatus* Pat. by Bondartsev (1953, p. 48), *P. brownei* Pers. by Donk (1960, p. 189), *P. connatus* Weinm., and *Poria aroha* Cunn. by Cunningham (1965, pp. 149–150).

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The principal characters that distinguish *Flaviporus* from other genera are: lignicolous habit, small and thin basidiomes, small pores, dimitic hyphal system, agglutinated hyphae in dried basidiomes, generative hyphae with clamp connections and small, broad spores. Three species included in the genus have all of these features. Two species lack one of them and in another two species one of the features could not be evaluated because the collection was poorly preserved. *Flaviporus minutisporus* and *F. semisupiniformis* deviate in lacking agglutinated hyphae. And the basidiomes of *F. subundatus* and *F. verniciftuus* are in poor condition, thus clamps could not be found in *F. subundatus* and no spores were seen in *F. verniciftuus*. In addition, four species (*F. brownei*, *F. liebmanni*, *F. semisupiniformis*, and *F. subundatus*) have tramal cystidia which typically extend longitudinally through the trama to project beyond the hymenium. The cystidia are important in distinguishing the species, unfortunately they are often difficult to demonstrate in many specimens, therefore cystidial features are not included in the key to the species.

The features characterizing the genus have been itemized by Murrill (1905*a*, p. 360; 1908, p. 84; 1915, p. 65), Bondartsev (1953, p. 48, 535), Cunningham (1965), and Domański *et al*. (1973, p. 60). Murrill's (1905*a*, p. 360; 1908, p. 84; 1915, p. 65) characterizations of *Flaviporus* as having a "context thick, woody, brown," seem to be an error, for he (1908, p. 84; 1915, p. 65) described the context of *F. rufoflavus* as "thin, pallid, less than 1 mm thick" and of *F. crocitinctus* as "thin, fibrous, flavous to luteous, scarcely 1 mm thick." The generic descriptions in Bondartsev and in Domański *et al*. are essentially the features of the type species, the only species of *Flaviporus* known to them. Domański *et al*. (1973, p. 61) considered the hyphal system to be monomitic and the spore walls to be cyanophilous. The latter may be a typographical error for acyanophilous, the initial letter "*a*" having been accidently deleted, because they do not mention cyanophily in their subsequent detailed description of the type species, *F. brownei*. Moreover, the discrepancy between their interpretation and mine of the type of hyphal system is understandable for, as emphasized below, the hyphae are agglutinated and their details extremely difficult to discern. Cunningham's concept of *Flaviporus* includes the characters of two discordant species that he included and is more broadly circumscribed than the concept I propose.

Initially the features that distinguish *Flaviporus* from *Rigidoporus* were not obvious, and Pouzar (1966, p. 369) stated that the limits of the two genera were "rather obscure and possibly both genera will be combined at some future date." Following a study of the seven species accepted in *Flaviporus* and several species excluded from the genus, the genera seem distinct. The species of *Rigidoporus* have hyphae distinct, broader, simple-septate, rather loosely arranged, spores larger and subglobose, cystidia (when present) larger, clavate, and apically incrusted and basidiomes thicker, larger, and with large pores.

Microporellus Murr. (1905*b*, p. 483) includes several species that share many features with *Flaviporus*. However, the species of *Microporellus* are distinctly stipitate with a comparatively large stipe, have longer tubes, rather large pores, context hyphae distinct, and the spores larger than in the species of *Flaviporus*. For example, *M. dealbatus* (Berk. & Curt.) Murr., the type species of the genus, has a stipe 5–7 cm × 0.5–1 cm, tubes up to 4 mm long, pores six to seven per millimetre and spores 5–6 μm × 4–5 μm (Overholts 1953, p. 223).

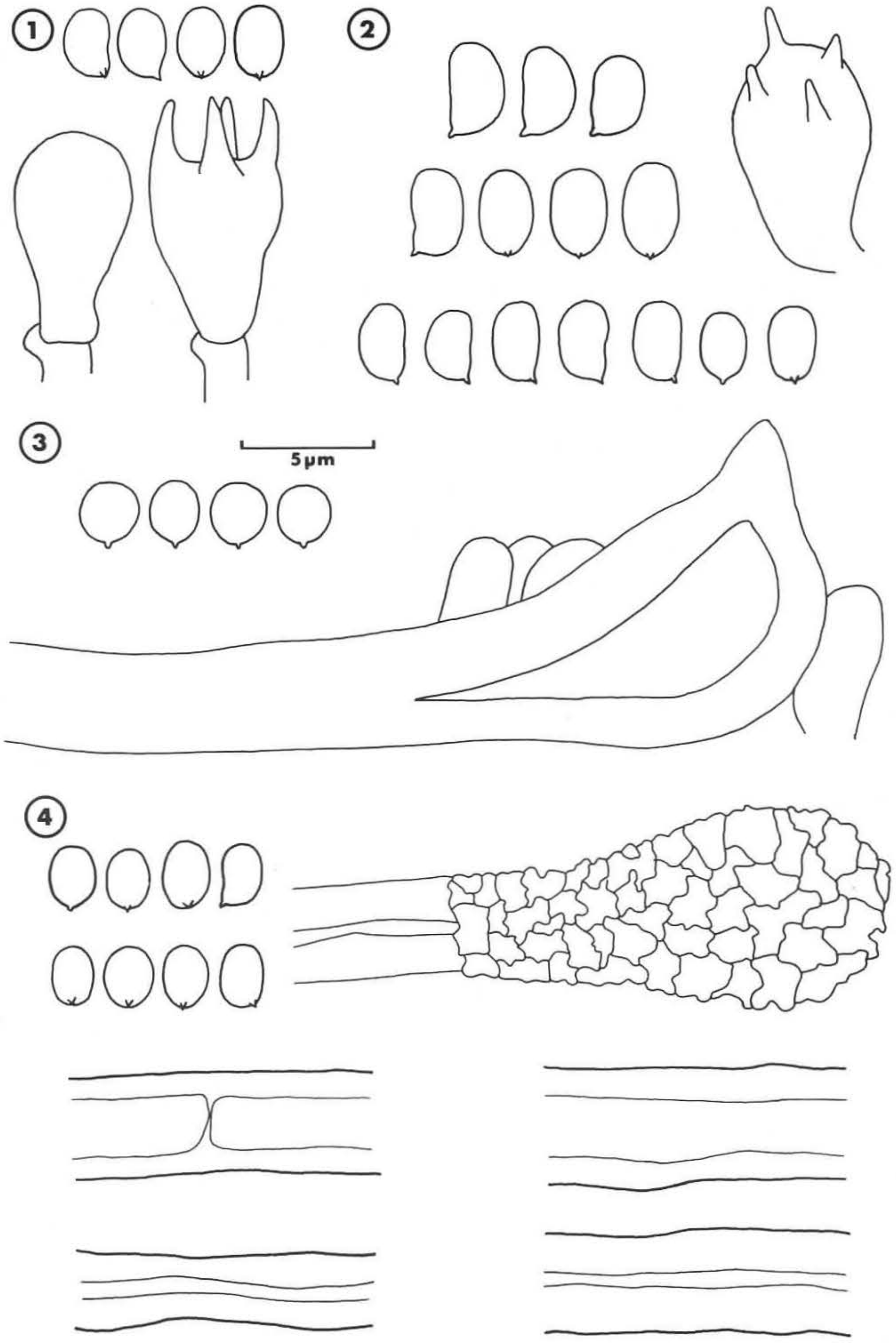
Several suggestions are given below on how to key out *Flaviporus* in two recently published keys (Pegler 1973; Ryvarden 1976) for polyporoid fungi. The only species of *Flaviporus* which occurs, or is likely to occur, in the area covered by Ryvarden's *Polyporaceae of North Europe* is *F. brownei*. The additions to his key that will lead to *Flaviporus* are

48. Pore surface typically sulphur yellow, unchanged when bruised, spores 2.6–2.8 μm × 1.8 μm .... *Flaviporus*
76. Hymenophore poroid, hymenium with cylindrical cystida 6–7 μm in daimeter, incrusted over the apical 40–80 μm, spores broadly ellipsoid 2.6–2.8 μm × 1.8 μm, skeletals dominating in the fruitbody .... *Flaviporus*

In Pegler's (1973) key to the polyporoid genera some additions are needed so that the genus *Flaviporus*, as herein characterized appears in the appropriate key choices.

The additions are

62″. Poroid, context hard, thin, dimitic with skeletals, spores broadly ellipsoid, broadly oblong or subglobose 2.4–3.6(–3.8) μm × 1.6–2.5 μm .... *Flaviporus*
107″. Spores broadly ellipsoid to subglobose 2.4–3.6(–3.8) μm × 1.6–2.5 μm .... *Flaviporus*
108″. Resupinate, cystidia incrusted, spores broadly ellipsoid, broadly oblong to subglobose 2.4–3.6(–3.8) μm × 1.6–2.5 μm .... *Flaviporus*
109″. Context not duplex, spores broadly oblong, broadly ellipsoid to subglobose 2.4–3.6(–3.8) μm × 1.6–2.5 μm .... *Flaviporus*



FIGS. 1–4. *Flaviporus* species. Fig. 1. *F. brownei*. Spores from holotype (K) of *P. rufoflavus*. Basidia from Rabenh. Fungi Europaei No. 2005 (S). Fig. 2. *F. liebmanni*. Spores, upper seven from Calder 84 (at K) and lower seven from isotype (K) of *P. substereinus*. Basidium from holotype (K) of *P. stereinus*. Fig. 3. *F. liebmanni* var. *subglobisporus*. Spores and cystidium from holotype (UPS). Fig. 4. *F. subundatus*. Spores, cystidium, and four hyphal segments with a variation of wall thicknesses from isotype (K).

KEY TO THE SPECIES OF *Flaviporus*

1. Pores 14–20 per millimetre 2
1. Pores 6–12 per millimetre 3
2. Spores broadly ellipsoid 2.6–3.4 µm long .... *F. liebmanni*
2. Spores mostly subglobose 2.4 µm × 2 µm .... *F. liebmanni* var. *subglobisporus*
3. Basidiomes effused 4
3. Basidiomes pileate 5
4. Pores sulphur yellow to cinnamon buff, 9–11 per millimetre; hyphae 2.5–4 µm in diameter .... *F. brownei*
4. Pores flesh pink, eight per millimetre; hyphae 3.2–5 µm in diameter .... *F. subundatus*
5. Basidiomes flabelliform, narrowly attached 6
5. Basidiomes dimidiate, broadly attached 8
6. Pores 7–9 (–12) per millimetre .... *F. hydrophilus*
6. Pores six per millimetre 7
7. Pileus purple black; thick-walled context hyphae to 8 µm in diameter .... *F. verniciflpuus*
7. Pileus cream colour; rather thin-walled context hyphae to 3.6 µm diameter .... *F. minutisporus*
8. Pileus dark red with darker concentric bands; spores broadly ellipsoid, 2.6–2.8 µm × 1.8 µm .... *F. brownei*
8. Pileus yellow, pale yellow, or cream colour; spores subglobose, 2.5–3 µm or oblong to broadly ellipsoid, 3.2–3.4 µm (–3.8) × 1.6–2.0 µm 9
9. Spores subglobose, 2.5–3 µm; tubes 10 per millimetre; incrusted tramal cystidia numerous, 60–110 µm × 6–9 µm .... *F. semisupiniformis*
9. Spores oblong to broadly ellipsoid, 3.2–3.4(–3.8) µm × 1.6–2.0 µm; tubes six per millimetre; cystidia lacking .... *F. minutisporus*

Flaviporus brownei (Pers.) Donk, Persoonia, 1: 189. 1960. Figs. 1,5,6

≡ *Polyporus brownei* Humb. ex Pers., Mycol. Eur. 2: 121. 1825.

= *Polyporus rufoflavus* Berk. & Curt., J. Linn. Soc. London Bot. 10: 310. 1868. *Flaviporus rufoflavus* (Berk. & Curt.) Murr., Bull. Torrey Bot. Club, 32: 360. 1905.

= *Polyporus braunii* Rabenh., Fungi Europaei No. 2005, Berlin, 1876. *Baeostratoporus braunii* (Rabenh.) Bond. & Singer in Singer, Mycologia, 36: 68. 1944.

= *Polyporus engelii* Harz, Bot. Centrbl. 36: 379. 1889.

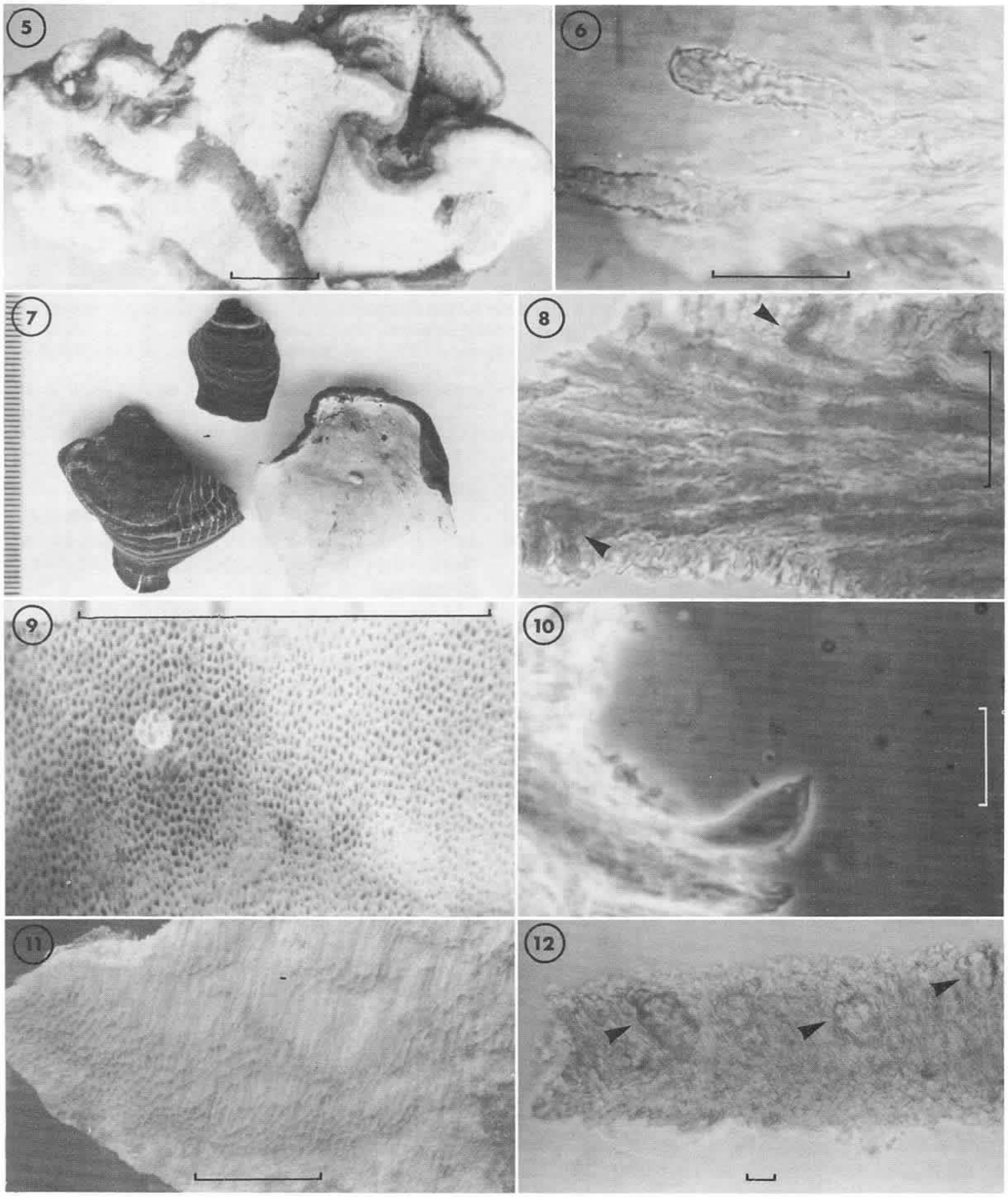
Basidiomes (Fig. 5) effused and up to 15 cm in diameter, reflexed and imbricate, or dimidiate, broadly attached, 1.5–5 cm × 0.8–4 cm and up to 1.5 mm thick; pileus surface dark red with darker purplish-black concentric bands, hard, brittle, glabrous, crustose; context hard, woody (not fibrous), pinkish buff to chestnut colour, to 0.8 mm thick; tubes angular, 0.8 mm long, sometimes in layers, 9–11 per millimetre, the mouths sulphur yellow to cinnamon buff, typically somewhat granulose.

Hyphal system dimitic; hyphae agglutinated, indistinct, acyanophilous, nondextrinoid, nonamyloid; skeletal hyphae numerous, rather thin-walled, aseptate, rarely branched, to 4 µm in diameter; generative hyphae rarely found, most common at the mouths of the tubes, thin-walled, with rare clamp connections, 2.5 µm in diameter; cystidia in the trama (Fig. 6), cylindrical, wall with an exterior gelatinous coating, 6–7 µm in diameter, crystalline incrusted over the apical 40–80 µm; basidia (Fig. 1) clavate, 10 µm × 4.4–4.8 µm, sterigmata four; spores (Fig. 1) broadly ellipsoid, adaxially flattened to slightly concave (i.e. subreniform), 2.6–2.8 µm × 1.8 µm, the wall hyaline, thin, smooth, acyanophilous, nonamyloid, nondextrinoid.

Lignicolous, associated with a white pocket rot, the pockets lenticular, up to 10 mm × 1 mm, in tropical and southern hemisphere countries found in the forest, in Europe found in glasshouses and mines, in the Americas it occurs only as far north as Cuba and Mexico. Specimens were studied from Bolivia, Brazil, Cuba (*P. rufoflavus*, C. Wright, 191, holotype K), Germany (*P. braunii*, Berlin, Rabenh., Fungi Europaei 2005, isotype S and *P. engelii*, "Bavaria, 1887, misit Dr. Harz," presumably isotype S), British Isles, Juan Fernandez, Philippine Islands, and Zambia. Also reported as widespread in Europe (Pilát 1938, p. 221), found in Jamaica, Brazil, Mexico, Ecuador (all reported by Pilát 1938), Venezuela (Berkeley and Curtis l.c.; Dennis 1970, p. 111), Tristan de Cunha (Reid 1955) and in Asia from Malacca, Sarawak, Borneo, Ceylon (all reported in Pilát 1938), and New Zealand (Cunningham 1965).

The sulphur yellow pores and chestnut brown pileus surface are the most obvious features that separate *F. brownei* from the other species of *Flaviporus*. Macroscopically the type specimen of *F. rufoflavus* resembles a small basidiome of *Rigidoporus zonalis* (Berk.) Imaz. but the tissue structure, broader, simple-septate hyphae, subglobose spores, and larger cystidia distinguish *R. zonalis*.

Domański *et al*. (1967, 1973), Cunningham (1965), Reid (1955), Bondartsev (1953), Wakefield (1952), and Pilát (1938) have described this fungus



FIGS. 5–12. *Flaviporus* species. Figs. 5 and 6. *F. brownei* from Rabenh. Fungi Europaei No. 2005 (S). Fig. 5. Basidiome. Scale bar equals 3 mm. Fig. 6. Incrusted tramal cystidia. Scale bar equals 20 μm. Figs. 7 and 8. *F. liebmanni*. Fig. 7. Basidiomes from Calder 84 (at K). Two showing the dark, zonate pileus surface and one showing the cream coloured tube mouths. Each division equals 1 mm. Fig. 8. Tramal cystidia stained with phloxine. Scale bar equals 20 μm. Figs. 9 and 10. *F. liebmanni* var. *subglobisporus* from holotype (UPS). Fig. 9. Minute tube mouths. Scale bar equals 3 mm. Fig. 10. Mucronate cystidium projecting through hymenium. Scale bar equals 20 μm. Figs. 11 and 12. *F. subundatus* from isotype (K). Fig. 11. Basidiome. Scale bar equals 3 mm. Fig. 12. Incrusted, imbedded tramal cystidia. Scale bar equals 20 μm.

but none satisfactorily characterized the hyphae because they are strongly agglutinated. Most authors have described the spores as subglobose, no doubt causing some confusion for, as Reid has emphasized, the spores are not subglobose but broadly ellipsoid.

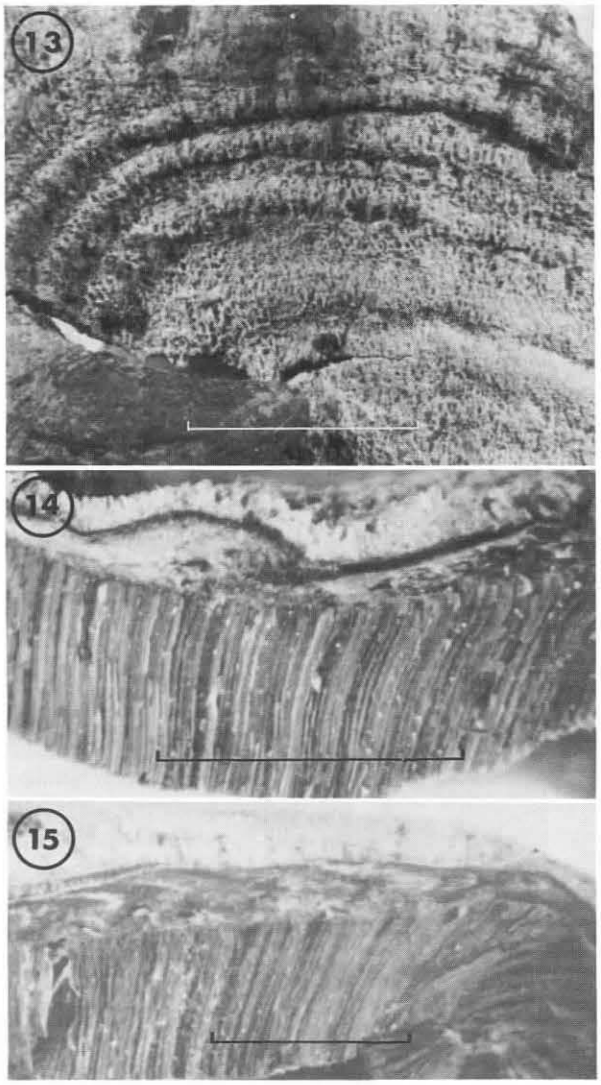
The above synonymy is based on study of the type specimens for all the names except *F. brownei*. From Persoon's (l.c.) description of *F. brownei*, and Bresadola's (1897, p. 76) note on the close similarity between *F. brownei* and *P. braunii*, I agree with Donk (1960, p. 189, 215) that *F. brownei*, *F. rufoflavus*, and *P. braunii* are names for the same fungus. Unfortunately Donk did not give the observations on which his opinion was based. Additional synonyms are given by Pilát (1938, p. 220) and Donk (1974, p. 55). Cunningham (1965, p. 150) was presumably following Donk's (1960) list of synonyms.

Flaviporus hydrophilus (Berk. & Curt.) Ginns, comb.nov. Figs. 13–15

≡ *Polyporus hydrophilus* Berk. & Curt., J. Linn. Soc. London Bot. 10: 306. 1868. *Spongipellis hydrophilus* (Berk. & Curt.) Murr., North American Flora, 9(1): 39. 1907. *Tyromyces hydrophilus* (Berk. & Curt.) Lowe, Mycotaxon, 2: 46. 1975.

Basidiomes gregarious, sometimes confluent, pileate, flabelliform, narrowly attached, essentially substipitate, about 4 cm broad, 3 cm deep, and up to 3.2 mm thick; "When fresh, heavy and saturated with water. Pileus 2 inches or more across, evidently much contracted [on drying]" (Berkeley and Curtis); pileus surface (Fig. 13) pale yellow brown to Ridgway's Clay Color (near Munsell 7.5YR5/6), with a short, dense tomentum which may form concentric bands in the marginal 1 cm of the pileus or the tomentum worn and the pileus glabrous and blackish; context (Figs. 14–15) thin (up to 0.7 mm thick), in vertical section with a thin to rather thick, black, waxy layer adjacent to the tube layer which in some places extends as streaks through the context, over which lies the Clay Color, dry, dull, somewhat spongy appearing tomentum; margin above dark brown, waxy-hard (lacking tomentum), tapering to a thin, wavy, sometimes incised edge; tubes (Figs. 14–15) in vertical section waxy-hard, up to 2.5 mm long, dark reddish brown (Munsell 5YR3/4), the mouths concolorous, round to angular, 7–9 (–12) per millimetre, entire to somewhat lacerate.

Hyphal system dimitic; pileus tomentum composed of fascicles of parallel, agglutinated, thin-walled hyphae; context hyphae randomly woven, sometimes in short strands or fascicles, hyaline, thin- to rather thin-walled (–1 μm), occasionally septate, some septa with clamp connections, 2.8–8 μm in diameter; skeletals in the waxy layer strongly agglutinated, parallel, rather thin-walled, septa not seen, 2.5–3.5 μm in diameter; hyphae next to the tubes hyaline, thick-walled (3(–5) μm), with clamps, 5–10 μm in diameter, occasionally swollen to 20 (–45) μm; tramal hyphae agglutinated, parallel, closely packed, with clamps, rather thin-walled, 2–2.8 (–3.5) μm in diameter; cystidia lack-



FIGS. 13–15. *Flaviporus hydrophilus*. Fig. 13. Tomentum of pileus surface from C. Wright (353), Herb. Curtis (FH). Scale bar equals 1 cm. Figs. 14 and 15. Vertical sections of context with waxy lines and tube layer from C. Wright (353), Herb. Curtis (FH) and "cotype" (FH), respectively. Scale bar equals 3 mm.

ing; basidia not preserved; spores broadly ellipsoid, adaxially flattened and typically slightly concave (i.e., subreniform), 3.4–3.6 μm × 2.2–2.4 μm, the wall nondextrinoid, nonamyloid, acyanophilous, thin, hyaline, smooth.

Lignicolous, "on logs" (Berkeley and Curtis l.c.), the associated rot unknown. Reported (Murrill 1907, p. 39; 1915, p. 25; Lowe 1975) from Cuba and British Honduras. I studied isotypes and paratypes of the two specimens cited by Berkeley and Curtis as Wright Nos. 350 and 353. These parts are labelled as: (1) Fung. Cuben. Wright. 196, C. Wright (353). cotype (FH), (2) F.C.W. No. 196, ?Wright (350), comm. Dr. House (BPI), (3) Fung: Cub: !96, C. Wright (353), Herb. Curtis (FH), and (4) Cuba, Wright 353, ex Herb. Bresadola (BPI).

The thick-walled hyphae located in a narrow zone between the tube layer and the waxy layer of the context are rare to common depending upon the section examined. In general they are difficult to demonstrate in dried specimens. These hyphae seem to be the ones that Lowe (1975) called skeletal hyphae. Because I observed clamp connections on these hyphae, they are now labelled thick-walled generatives.

As in most other *Flaviporus* species, the dried basidiomes of *F. hydrophilus* have agglutinated hyphae which make the hyphal features and their organization difficult to discern. The basidiomes resemble, in general appearance, those of *F. liebmanni* (cf. Fig. 7). And the spores of *F. hydrophilus* are similar to those of *F. brownei*, *F. liebmanni*, and *F. subundatus* (cf. Figs. 1, 2, and 4).

Lloyd's (1912, p. 146) comment, presumably referring to the specimen at Kew, was "Type inadequate. Compare stereinus." *Polyporus stereinus* Berk. & Curt. is now a synonym of *F. liebmanni*.

Flaviporus liebmanni (Fr.) Ginns, comb.nov.
Figs. 2, 7, 8

≡ *Polyporus liebmanni* Fr., Nova Acta Regiae Soc. Sci. Ups. Ser. 3, 1:59. 1851. *Rigidoporus liebmanni* (Fr.) Murr., North American Flora, 9(1): 46. 1907. *Tyromyces liebmanni* (Fr.) Cunningham, Polyporaceae of New Zealand, p. 131. 1965. *Henningsia liebmanni* (Fr.) Ryvarden, Norw. J. Bot. 19: 231. 1972.

= *P. stereinus* Berk. & Curt., J. Linn. Soc. London Bot. 10: 308. 1868. *Leptoporus stereinus* (Berk. & Curt.) Pat., Ann. Crypt. Exot. 1, Fasc. 1, p. 10. 1928.

= *Polystictus rigescens* Cke., Grevillea, 14: 12. 1885. *Henningsia rigescens* (Cke.) Hennings in Engler & Prantl, Naturl. Pflfamil. 1 (1**) 189. 1900.

= *Rigidoporus substereinus* Murr., North American Flora, 9(1): 46. 1907.

Basidiomes (Fig. 7) flabelliform, laterally substipitate or narrowly attached, 3 cm × 3.5 cm and 3 mm thick; pileus when fresh tough-fleshy but readily cracking when bent, quite watery, zonate, varying shades of ochraceous brown and buff to flesh pink and pale red at the margin (from notes with Calder 84 at K), when dry blackish to dark purple brown or zonate with alternating bands chestnut and Clay Color (Ridgway), hard, glabrous, glossy; pore surface cream colour; tubes occasionally in several layers, each 0.5–1.8 mm long, the walls waxy-hard, pale brownish-cream colour (paler than the context), tube mouths angular, somewhat radially aligned, 14–20 per millimetre (Fig. 9); context hard, shiny, pale brown to blackish brown, typically 0.5 mm thick.

Hyphal system dimitic; generative hyphae indistinct, agglutinated, parallel, closely packed, hyaline, thin-walled but some specimens with a few thick-walled, septa rare, some with clamps, nondextrinoid, nonamyloid, acyanophilous, 2–4 μm in diameter; skeletal hyphae pale yellow, thick-walled (0.8–2 μm), branches few and indistinct, 2.8–6 (–6.8) μm in diameter; tramal hyphae agglutinated, parallel, thin- to rather thin-walled (–1.2 μm), with rare clamp connections and some simple septa, 2.4–4.8 μm in diameter; cystidia (Fig. 8) numerous to rare or apparently lacking, in the trama longitudinally arranged, bent almost 90° to project into the hymenium, apex fusoid, thin- to rather thin-walled, 4–6 μm in diameter; cystidioles rare, with papillate apices; basidia (Fig. 2) clavate, 6–12 μm × 4.4–5 μm, sterigmata four; spores (Fig. 2) broadly ellipsoid, adaxially flattened to a slightly concave (i.e. subreniform), 2.6–3.4 μm × 1.6–2.2 μm, the wall hyaline, smooth, acyanophilous, nonamyloid, nondextrinoid.

Lignicolous, the host or substrate not specified, associated with a white rot. Circumglobal, south of the Tropic of Cancer, from Cuba, Dominica, Mexico, Bolivia, Brazil, British Guiana (Dennis 1970, p. 109 as *R. substereinus*), Columbia, Peru, Angola, Burundi (Ryvarden 1978, p. 104 as *Henningsia liebmanni*), Uganda, Zaire (Ryvarden, l.c.), Tropical East Africa (Ryvarden 1972, p. 231 as *Henningsia liebmanni*), ? South Africa (Doidge 1950, p. 539 as *Polystictus stereinus*), Australia (Cunningham 1965, p. 132), Vietnam (Patouillard 1928, as *Leptoporus stereinus*), Fiji (Cunningham, l.c.), New Caledonia (Cunningham, l.c.), Java, Malaya, Papua and Samoa.

TYPE SPECIMENS EXAMINED: *P. liebmanni*, Mexico, Liebman (here designated neotype, UPS). *Polystictus rigescens*, Malaya: Larut Peak, August 1883, Dr. G. King 4818 (holotype, K). *Polyporus stereinus*, Cuba, C. Wright 189 (holotype, K). *Rigidoporus substereinus*, Cuba, March 1903, Underwood and Earle 1211 (isotype, K).

Bresadola (1912, p. 495) listed *P. stereinus* and *Polystictus rigescens* as synonyms of *F. liebmanni* and I concur. *Polystictus puiggarii* Speg. may be a synonym because there is a collection (apparently not the type) in Bresadola's herbarium (S) labelled "*Polystictus Puiggarianus* Speg. (n.sp. incerta) B 131, Apiahy, 1884, Dr. Spegazzini" and it is *F. liebmanni*. I do not agree (see Ginns 1979) with Ryvarden's (1972) listing of *Henningsia geminella* Moell. as a synonym.

The hyphae of the context and trama are agglutinated and their features and arrangement are difficult to discern. Septa are uncommon and difficult to find. Clamp connections in one collection from Mexico and one from Brazil were at the base of the hymenial elements and on the thin-walled hyphae of the margin. Cunningham (1965, p. 132) also reports the presence of clamp connections in this species.

The hyphal system in *F. liebmanni* is described as dimitic but differing opinions exist due to the difficulty in determining hyphal features. Lowe (1974, note with the type of *substereinus* at K) described the context as monomitic, hyphae rarely branched, thin- or rather thin-walled, apparently rarely simple-septate, 3–5 (–6) μm in diameter. And he (1975, note with type of *stereinus* at K) observed that the context hyphae were thin- to less often thick-walled, lumen continuous and cross walls not seen so these hyphae may be skeletals. L. Ryvarden (personal communication) recorded the system in the type of *stereinus* (K) as trimitic with very few binding hyphae seen. Obviously more observations are needed before the kinds of hyphae in *F. liebmanni* are adequately described.

The tramal cystidia in most dried specimens are exceedingly difficult or impossible to find. In the younger tramal tissue (i.e. near the tubemouth), cystidia are thin-walled and stain intensely in phloxine, but in the older tramal tissue they are thick-walled and often bent and curved into the hymenium.

Flaviporus liebmanni var. ***subglobisporus*** Ginns, var.nov. Figs. 3,9,10

Habitu et textura ut *liebmanni*, praecipue differt sporis subglobosis ad ellipticis late, 2.4 μm × 2.0 μm, basidiis clavatis late, 15 × 4 μm, cystidiis typice potius parietibus crassis; ad apicem inflatis, mucronatis.

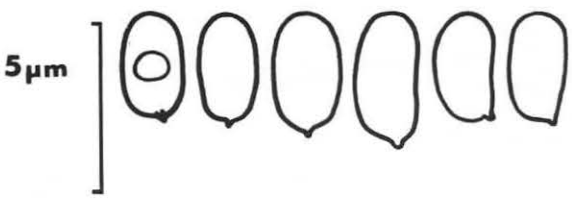


FIG. 16. *Flaviporus minutisporus*. Spores from holotype (K).

HOLOTYPUS: Brazil: Rio Negro, ut *Polyporus mutabilis* Berk. fide Berkeley (UPS, Fries herb.)

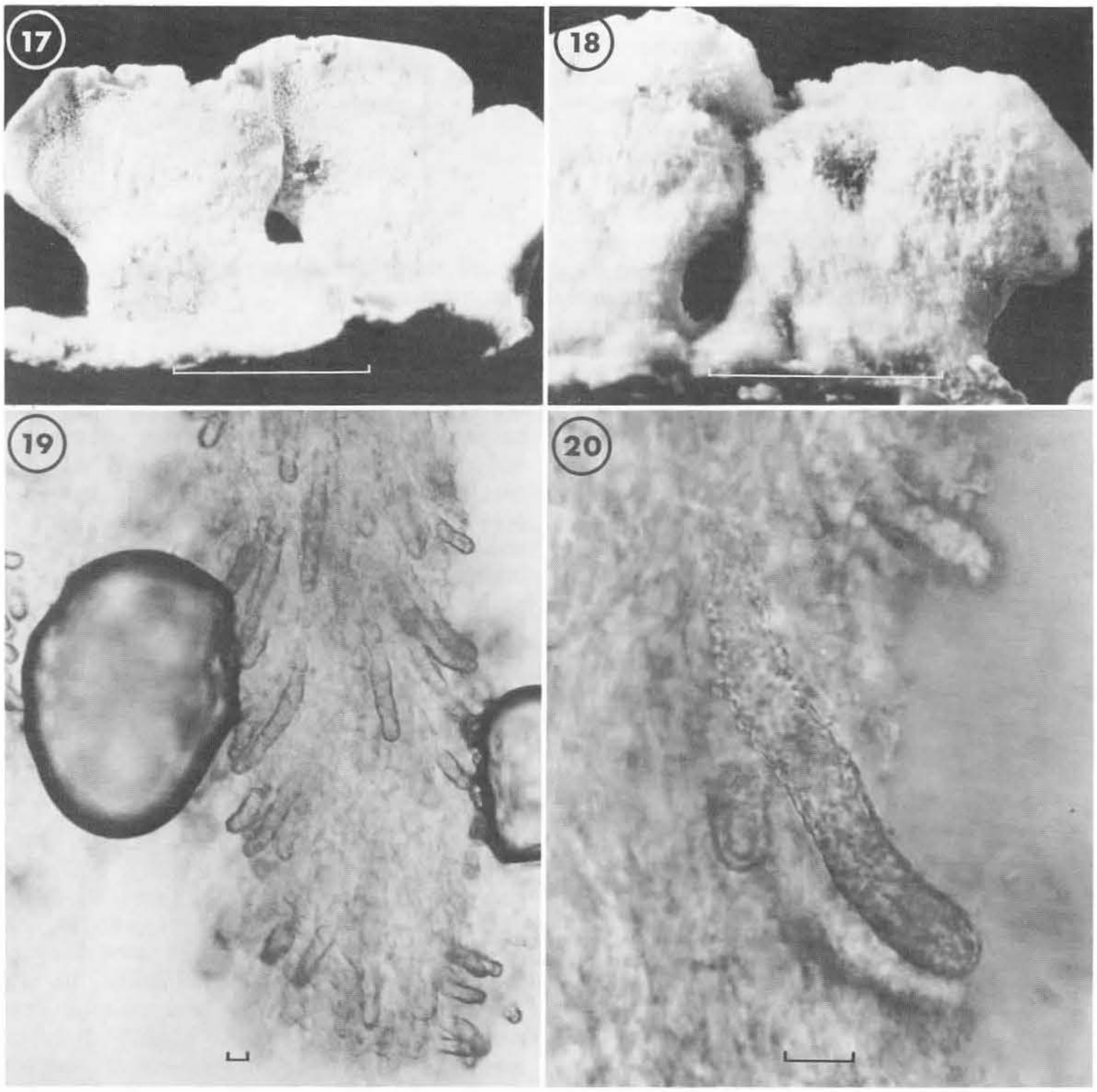
Macroscopically variety *subglobisporus* is like *liebmanni*. The variety *subglobisporus* differs in having typically small subglobose spores (Fig. 3) and apically swollen (to 11 μm), typically mucronate cystidia (Figs. 3,10) with their features well preserved in the dried basidiome. *Flaviporus semisupiniformis* has subglobose spores, 2.5–3 μm but the pores are larger, 10 per millimetre.

Flaviporus minutisporus (Reid, Thind & Chatrath) Ginns, comb.nov. Fig. 16

≡ *Polyporus minutisporus* Reid, Thind & Chatrath, Trans. Br. Mycol. Soc. 42: 42. 1959.

Basidiomes annual, imbricate, fused, dimidiate, each appearing narrowly attached (i.e., vaguely flabelliform), "fleshy, tough and brittle when fresh" (Reid *et al.*, l.c.), and 2 cm × 2 cm and 3:5 mm thick; pileus surface Cream Color (Munsell 2.5Y8/4), matted-tomentose, finely granulose to shiny where rubbed; context Cream Color (slightly darker than 2.5Y8/4), homogeneous, hard, chalky-woody, to 1.5 mm thick; tubes angular to round, 2 mm long, six per millimetre, the mouths slightly greyer than the colour of the tubes in vertical section, edges even to slightly fimbriate or wavy, in vertical section thin-walled, waxy-hard, pinkish tan (7.5YR6/4), distinctly darker than the context.

Hyphal system dimitic; hyphae acyanophilous, nonamyloid, nondextrinoid; context hyphae not agglutinated, randomly rather loosely woven; generative hyphae hyaline, septate with some clamps, thin-walled, 2–6 μm in diameter; skeletals serpentine, pale yellow, slightly refractive, rather thin-walled, occasionally branched, 2.8–3.6 μm in diameter; tramal hyphae agglutinated, generatives as in context but 2–4.5 μm in diameter, skeletals scattered, with some simple septa, to 5 μm in diameter; cystidia lacking; basidia "clavate, minute, with four sterigmata" (Reid *et al.*); spores (Fig. 16) oblong to broadly ellipsoid, adaxially flattened to slightly concave (i.e. subreniform), 3.2–3.4 (–3.8) μm × 1.6–2.0 μm, the wall hyaline,



FIGS. 17–20. *Flaviporus semisupiniformis* from isotype (BPI). Fig. 17. Pore surface with rather broad sterile margin. Scale bar equals 5 mm. Fig. 18. Tomentum of pileus surface. Scale bar equals 5 mm. Fig. 19. Vertical section of lower portion of trama with numerous cystidia. Scale bar equals 10 µm. Fig. 20. One incrusted tramal cystidium. Scale bar equals 10 µm.

thin, smooth, acyanophilous, nonamyloid, nondextrinoid.

"On stump of a deciduous tree, the park, Mussoorie, India, 11 September 1953" (Reid *et al.*, l.c.).

The above description, except for the segments quoted, results from my observations on part of the holotype which was sent on loan from K; there are thus some minor differences between my description and the original.

The species is known from only one collection. The comparatively large pores, distinct (i.e. not agglutinated) context hyphae and lack of cystidia distinguishes *F. minutisporus* from other species of *Flaviporus*.

Flaviporus semisupiniformis (Murr.) Ginns, comb.nov. Figs. 17–20

≡ *Tyromyces semisupiniformis* Murr., N.Y. Bot. Gard. Bull. 8: 148. 1912.

Basidiomes (Figs. 17, 18) annual, imbricate, laterally confluent, dimidiate with the tube layer extending down the surface of the substrate for several millimetres, each 0.7 cm × 2(–3) cm and 1.5 mm thick; pileus surface yellow to pale yellow, subzonate, the newer growth floccose, tomentose (Fig. 18) or matted-tomentose, next to the substrate glabrous-waxy; context pallid, homogeneous, firm, woody, quickly spongy and tough-fibrous when wetted, 1 mm thick; margin (Fig. 17) yellow, slightly darker than the tube mouths, entire, slightly wavy, sterile below, to 1 mm wide; tubes (Fig. 17) round, 0.5 mm long, 10 per millimetre, in vertical section a pale yellow to pale orange buff, waxy-hard, the mouths entire, appearing frosted.

Hyphal system dimitic; hyphae acyanophilous, nonamyloid, nondextrinoid; context hyphae distinct (i.e. not agglutinated); generatives hyaline, thin- to rather thin-walled, with clamp connections, branched, 2–4 µm in diameter; skeletals comprising 80% of the context, pale yellow, thick-walled (i.e. the lumen very narrow), 3–5 µm in diameter, branched but not frequently so; tramal hyphae of two types, generatives with clamps, frequently branched, serpentine, in vertical sections resembling a reticulum, rather thin-walled (0.7 µm), 1.5–2 (–3) µm in diameter, and with skeletals comprising 20% of the trama; cystidia (Fig. 20) numerous, confined to the lower half of the tube layer (Fig. 19), cylindrical to slenderly clavate, 60–110 µm × 6–9 µm, imbedded to projecting (up to 40 µm), the wall hyaline, thick (3.5–4 µm), with the apical 40–60 µm incrusted with small granules (0.5 µm in diameter); cystidioles scattered in the hymenium, with papillate apices, 4 µm in diameter; basidia poorly preserved, clavate, about 12 × 3.6 µm; spores subglobose, 2.5–3 µm in diameter, the wall hyaline, thin, smooth, acyanophilous, nonamyloid, nondextrinoid.

Lignicolous, "on the side of a large log" (Murrill 1915). Known from only the type specimen (I examined the part at BPI) collected near Jalapa, Mexico, W.A. Murrill (No. 53), December 12–20, 1909.

Lowe (1975) has described this specimen in detail and my observations agree with his except that my description includes more details of the hyphae and distinguishes the context hyphae from the hyphae in the trama. In the trama the generatives are narrower, rather thin-walled and more branched. Lower, not incorrectly, simply reported that the generatives of the trama were "similar" to those of the context.

The combination of fibrous context, subglobose spores, and long cystidia distinguishes *F. semisupiniformis* from the other species of *Flaviporus*. The cystidia (Figs. 19, 20) are the tips (sometimes over 100 µm long) of skeletal hyphae incrusted with small granules.

The fibrous context and distinct hyphae suggest that basidiomes of *F. semisupiniformis* are of a different texture when fresh than basidiomes of *F. brownei*, *F. hydrophilus*, *F. liebmanni*, *F. subundatus*, and *F. verniciflluus*. In this respect *F. semisupiniformis* is peripheral to the species that form the core of *Flaviporus*. However, *F. semisupiniformis* certainly has more in common with these species of *Flaviporus* than it apparently has with the type species of *Tyromyces* Murr., the genus where Murrill (1912, p. 148) and Lowe (1975) placed *F. semisupiniformis*.

Flaviporus subundatus (Murr.) Ginns, comb.nov. Figs. 4, 11, 12

≡ *Poria subundata* Murr., Mycologia, 13: 86. 1921.

Basidiome (Fig. 11) effused, now in pieces the largest 2 cm × 1 cm and 1 mm thick; pore mouths flesh pink; tubes angular, eight per millimetre, nearly 1 mm long, the walls thin, waxy-hard, the edges entire; context very thin (0.1 mm) and indistinct, cream colour.

Hyphal system apparently dimitic; hyphae agglutinated, indistinct; generatives hyaline, thin- to rather thin-walled (1(–2) µm thick), simple-septate, branched, 3–6 µm in diameter; skeletals 3.2–5 µm in diameter, thick-walled (–2 µm), unbranched, aseptate; cystidia (Figs. 4, 12) indistinct, scattered, cylindrical to clavate, 7 µm in diameter, apically incrusted with a crystalline mass up to 50 µm × 30 µm; cystidioles uncommon, fusoid or the apex slightly elongated and fingerlike; basidia clavate, 10–15 µm × 4.5 µm, sterigmata four, each 2.4 µm long; spores (Fig. 4) broadly ellipsoid to broadly oblong, adaxially flattened to slightly concave (i.e. subreniform), 2.4 µm × (1.6–) 1.8(–2) µm, apiculus minute, the wall hyaline, smooth, thin, nondextrinoid, nonamyloid, acyanophilous.

On the bark of an angiosperm, associated with a white rot. Only one collection is known: Cuba, 1903, Underwood and Earle 1168 (K isotype).

I am convinced that the spores described above belong to *F. subundatus*, although Lowe (1966, p. 25) thought they might belong to another fungus.

Most species of *Flaviporus* have agglutinated hyphae which are difficult to separate. Because several other species (i.e., *F. brownei*, *F. liebmanni*, and *F. verniciflluus*) have skeletals like those in *F. subundatus* as well as rare generative hyphae with clamps, it is possible that a system of generative hyphae with clamp connections will be discovered in *F. subundatus* when more collections are examined.

Flaviporus verniciflluus (Berk.) Ginns, comb.nov.
≡ *Polyporus verniciflluus* Berk., Fungi, p. 254 *In* The botany of the antarctic voyage. Part III. Vol. II. *Edited by* J. D. Hooker. Flora Tasmaniae, 1860.

Basidiome flabelliform, laterally substipitate, small (1.5 cm × 1.5 cm and 2 mm thick); pileus surface azonate, glabrous-shiny, smooth, purple black, appearing to comprise radially appressed, fine fibrils; context 0.5 mm thick, mostly purple black, very hard and shiny with clay coloured, fibrous patches next to the tubes; hymenium "pallido" or "pale" (Berkeley); tubes angular, 1.5 mm long, about six per millimetre.

Hyphal system dimitic; context hyphae in the waxy areas agglutinated and their detail obscure; hyphae in the fibrous areas with generatives hyaline, thin-walled, to 5 µm in diameter, with clamp connections (L. Ryvarden, personal communication), skeletals the predominating type of hyphae, rather thin- to thick-walled (1.5–3 µm), simple-septate, 3.5–8 µm in diameter, with branches widely separated but not uncommon; tramal hyphae agglutinated, longitudinally woven, generally rather thin- to thick-walled (–1.6 µm), rarely branched, rarely simple-septate, 4–6 µm in diameter; basidia, cystidia, and spores not found.

The only collection known is the type (K) from Tasmania. Lignicolous, "On dead wood" (Berkeley, l.c.) and its microscopic features are not well preserved. Lloyd's (1912, p. 148) only comment was "Type inadequate." Cunningham (1965, p. 123) listed *verniciflluus* as a synonym of *Polyporus catervatus* Berk. but *P. catervatus* (type seen at K) is quite different not only in macroscopic appearance, but also microscopically for all its hyphae are distinct and clamps are common. Cunningham (1965) also listed *P. rasipes* Berk. (type seen at K) as a synonym of *F. verniciflluus* and *P. catervatus* but it is distinct from both.

Flaviporus liebmanni is similar macroscopically, but with smaller pores (14–20 per millimetre), context hyphae indistinct and more difficult to separate, and it has cystidia. These differences are sufficient reasons to keep it separate from *F. liebmanni*.

Excluded species

Polyporus aquosus Henn., Hedwigia, 43: 199. 1904. Specimen examined Brasil: S. Paulo: Serra da Cantareira, 3.1903, leg. A. Puttemans, No. 796, ex Herb. Sydow (isotype S). The specimen is one-half of a laterally substipitate, lobate basidiome and it is 11 cm × 9 cm wide, 1 mm thick, blackish, horny, with the tubes flattened. It appears to have been dried in an efficient plant press. Its texture suggests that it was watery and cartilaginous when fresh. Its microscopic features are now indeterminable. I examined the specimen because Saccardo and Saccardo (1905, p. 112) noted that it was near *P. hydrophilus* (treated above as *Flaviporus hydrophilus*) and *Polystictus rigescens* (now a synonym of *F. liebmanni*) and I thought it might be a species of *Flaviporus*.

Fidalgo (1965) presented a detailed description of the part of the type of *Polyporus aquosus* in Rio de Janeiro (RBR). The fungus is monomitic, the generative hyphae are 5–12(–15) µm in diameter wtih clamp connections. Spores are elongated, hyaline, smooth, (7–)8–10(–12.5) µm × 3.5–4.5(–5) µm. Lloyd's (1912, p. 130) photograph of a freshly collected *P. fuscomaculatus* Bres. closely resembles my idea of what *P. aquosus* would be like when fresh. Bakshi (1971, p. 145) notes that *P. aquosus* occurs in India, probably taken from Lloyd (1912), but he attributes spores 6–8 µm × 14–16 µm to "Lloyd, 3:L,1," a citation I cannot locate in either Lloyd's writings or Stevenson's (1933) index to Lloyd's writings.

Overeem and Weese (1924) list *P. aquosus* as a synonym of *Polyporus udus* Jungh.

Flaviporus aroha (Cunn.) Cunn., N.Z. Dep. Sci. Ind. Res. Bull. 164: 150. 1965. The type (seen at K) is dimitic with skeletals dextrinoid, simple-septate, 3–5(–6.5) µm in diameter and generatives uncommon, with simple and clamped septa. Spores rare, cylindrical, 11 µm × 4 µm. Cunningham by including this species and *Polyporus connatus* Weinm. (see below) in *Flaviporus* indicated that his concept of the genus was much broader than I can accept.

Polyporus broomei Rabenh., Fungi Europaei No. 2004. Berlin, 1876. Although Patouillard (1898, p. 153) listed *P. broomei* as one of several species that he felt formed a homogeneous group around *F. rufoflavus* (now a synonym of *F. brownei*), Murrill (1921, p. 87), Bourdot and Galzin (1928, p. 682), Pilát (1938, p. 250 as *Physisporinus vitraeus*), and Bondartsev (1953, p. 135 as *Podoporia vitrea*) refer the name to synonymy under *Poria undata* (=*Rigidoporus undatus* (Pers.) Donk). After studying two issues of Fungi Europaei No. 2004 at Kew I agree with them. The fungus has relatively broad, simple-septate hyphae, incrusted cystidia, and comparatively large subglobose spores.

Flaviporus canaliculatus (Pat.) Bond. (Art. 42: not validly published because the complete literature citation for basionym was not included). The Polyporaceae of the European U.S.S.R. and Caucasia, p. 48, 1953. Patouillard (1898) described this fungus as a species of *Polyporus* and he noted that it, "*P. Braunii* Rabenh. (= *P. rufoflavus* Berk. & Curt.), *P. stereinus* Berk., *P. Broomei* Rabenh. et quelques autres" form a homogeneous group. Pilát (1938, p. 220) listed *P. canaliculatus* as a "?" synonym of *P. rufoflavus* but the two names represent different species. The type specimen (Patouillard herb., FH) of *P. canaliculatus* is a collection of ***Rigidoporus cartilagineus*** (Berk. & Br.) Ginns, comb. nov. (basionym: *Polyporus cartilagineus* Berk. & Br., J. Linn. Soc. London Bot. 14: 49. 1875).

Flaviporus connatus (Weinm.) Cunn., N.Z. Dep. Sci. Ind. Res. Bull. 164: 149. 1965. This epithet is generally accepted as a synonym of *Oxyporus populinus* (Fr.) Donk. Inclusion of this species in *Flaviporus* broadens the generic limits beyond those acceptable to me.

Flaviporus crocitinctus (Berk. & Curt.) Murr., Bull. Torrey Bot. Club, 32: 360. 1905. This species and *F. rufoflavus* (now a synonym of *F. brownei*) were the two species on which Murrill based his new genus when he proposed *Flaviporus*. The type (K) of *F. crocitinctus* has been referred to *Inonotus* by L. Ryvarden (personal communication) and I agree.

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